

The counting of the Chart plates has been continued during the year, and completed between Dec. 64° and Dec. 70°. A paper on the statistics of the stars between 65° and 70° N. Dec. was communicated to the Royal Astronomical Society in January, and printed in the *Monthly Notices*.

The 28-inch refractor has been used throughout the year for micrometric measurements of double stars. The total number of double stars measured during the year is 381; of these 192 have components less than 1".0 apart, and 105 less than 0".5.

Series of measures have been obtained of  $\kappa$  Pegasi,  $\delta$  Equulei, 70 Ophiuchi, and  $\zeta$  Herculis. Capella has been examined at every favourable opportunity, and observations of the position angle of the elongated image have been secured on eight occasions.

**Solar Activity.**—Shortly after the date of the last report a long period of almost complete solar quiescence set in; from 1902 June 5 to September 17 inclusive, a period of 105 days, the mean daily spotted area was less than a single unit (one millionth of the sun's visible hemisphere). An active period set in on September 18 and lasted until November 28, 72 days, the mean daily area being 164 millionths. The rest of the year 1902 was very quiet, the remaining 34 days showing a mean daily area of only 3. In the present year the sun has been much more active, and has been free from spots on only 14 days since January 1, as compared with about 100 in the same period of last year. The first of a fine series of spot-groups appeared on the east limb on 1903 March 21, and a succession of new groups has followed almost without intermission up to the date of this report. There can be no doubt, therefore, that the solar activity is very decidedly upon the increase.

Tables and diagrams showing the distribution of sun-spots in latitude and the areas of sun-spots and faculae compared with magnetic diurnal ranges for the 29 years 1874 to 1902 have been prepared, and will be published in the *Monthly Notices R.A.S.* for May.

**Magnetic Observations.**—The principal results for the magnetic elements for 1902 are as follows:—

Mean declination	...	...	16° 22' 8" West.
Mean horizontal force	...	...	{ 4.0134 (in British units).
			{ 1.8505 (in Metric units).
Mean dip (with 3-inch needles)	...	...	67° 3' 25".

**Meteorological Observations.**—The mean temperature for the year 1902 was 49°.1, or 0°.4 below the average for the 50 years 1841–90.

The rainfall for the year ending 1903 April 30 was 23.68 inches, being 0.86 inch less than the average of 50 years. The number of rainy days was 172. The rainfall has been less than the average for each of the eight years from 1895 to 1902 inclusive, the total deficiency for the eight years ending 1902 December 31 amounting to 28.91 inches. For the four months 1903 January–April there has been an excess of 0.95 inch.

## THEORY OF CYCLONES AND ANTICYCLONES.

PROF. F. H. BIGELOW contributes to the U.S. *Monthly Weather Review* for February a paper on the mechanism of counter-currents of different temperatures in cyclones and anticyclones. An outline theory of the structure of cyclones and anticyclones was described in the report of the Chief of the Weather Bureau for 1898–1899 (vol. ii). It was evident, however, that a more complete insight into the mechanism of motions in a fluid such as air under atmospheric conditions would be afforded by the construction of systems of isobars on at least three planes having different altitudes. For this purpose, the sea-level and the levels of 3500 and 10,000 feet were selected, and since December, 1902, daily reduced pressures for these planes have been received from the regular observing stations of the United States and Canada, and charts have been constructed for them. The approximate gradients needed for a preliminary consideration of the subject have thus been obtained, and the general results of the investigation are stated by Prof. Bigelow as follows:—

(1) The cyclone is not formed from the energy of the latent heat of condensation, however much this may strengthen its intensity; it is not an eddy in the eastward

drift; but it is caused by the counterflow and overflow of currents of different temperatures. Ferrel's canal theory of the general circulation is not sustained by the observations, nor is his theory of local cyclones and anticyclones tenable. There are difficulties with regard to the German vortex theory, but this is nearer the truth than the Ferrel vortex. The structure in nature is actually more complex than has been admitted in these theoretical discussions, but it doubtless can be worked out successfully along the lines herein indicated. (2) Regarding the relation of the upper level isobars to practical forecasting, it is noted as the result of the examination of charts that (a) the direction of the advance of the centre of the low pressure is controlled by the upper strata, and its track for the following twenty-four hours is usually indicated by the position of the 10,000-foot level isobars; (b) the velocity of the daily motion is also dependent upon and is shown by the density of these high level isobars; (c) the penetrating power of the cyclone is safely inferred from an inspection of the three maps of isobars of the same date; (d) there is decided evidence that areas of precipitation occur where the 3500-foot isobars and the 10,000-foot isobars cross each other at an angle in the neighbourhood of 90°; (e) there have been several cases in which the formation of a new cyclone has been first distinctly shown on the upper system of isobars before penetrating to the surface or making itself evident at the sea level. (3) It is expected that by completing our discussion of the temperature gradients between the surface and the higher levels we shall be able to secure daily isotherms as well as daily isobars on the upper planes, and this will tend to strengthen any further examination of these important problems. A suitable report will be prepared in which the data now coming into our possession will be subjected to a mathematical analysis and discussion.

## ATMOSPHERIC VARIATIONS.

FROM the results of recent researches solar prominences seem to be playing a most important part, not only in the mechanism of the solar atmosphere, but in the variations of our own. Any investigation, therefore, that gives us new ideas or corroborates the old is most useful and valuable. In a previous number of this Journal (vol. lxvii. p. 569, April) an account was given of the results obtained from a research on the distribution of solar prominences as regards latitude. The prominence circulation thus disclosed that there was practically a law at work which the centres of prominence action followed, and this law, deduced from observations extending over the longest period available (1872–1901), was found to be in good agreement with that first suggested by Prof. Ricco in 1891 (*Mem. d. Soc. degli Spett.*, vol. xx. p. 135). Prof. Bigelow has also been studying the question of prominence, facula and spot circulation, and in a recent number of the *Monthly Weather Review* (vol. xxxi. No. 1, p. 9) has stated his results. The method he adopted was somewhat different from the one first mentioned above, for the prominence circulation determined by him has been deduced by finding the mean variation of the prominence distribution resulting from coupling up together the values for those years which he considers are similar in relation to the eleven-year sun-spot cycle. Anyone familiar with this cycle knows the difficulty this involves, because it is only the mean length of the sun-spot period that is eleven years. Further, the epochs of maxima do not follow those of the minima at constant intervals, but vary from a little more than three to five years. In spite, however, of these probable sources of error, Prof. Bigelow deduces a circulation not very different from the one mentioned above, so that all the three computations and deductions show that there is a very definite movement in latitude and change in percentage frequency of occurrence from year to year.

A most interesting and important contribution, by Prof. T. H. Davis, to our knowledge of the fluctuation of the annual wind resultants, and indirectly to our knowledge of the movements of cyclones and anticyclones, appeared in one of the recent numbers of the *Monthly Weather Review* (vol. xxx. No. 11, p. 519). The investigation was restricted chiefly to stations included in the meteorological services of the United States and Canada, and the period discussed was the ten years 1891–1900. The results of the research

are best seen by consulting the map accompanying the paper, on which all the mean wind directions for each year and for each station are plotted.

Most interesting curves of wind resultants at Key West, Bermuda, Mt. Washington, and Pike's Peak are reproduced. Prof. Davis concludes by saying:—"The remarkable relations revealed by these tables and charts show that the natural relations of the winds are complex and still obscure. I see no indication of a sun-spot nor of a lunar influence. To what natural laws or combination of laws are we to attribute these variations in the annual resultants?" Perhaps, as a suggestion, Prof. Davis might correlate the variations of the wind directions in the southern stations with the barometric changes from year to year, which latter have recently been shown to be nearly identical with those in South America, and the inverse of those in the regions about the Indian Ocean and Australia.

In connection with the preceding paragraph, the paper by Prof. K. Kassner, on "Sonnenflecken, Depressionen der Zugstrasse V<sup>6</sup> und Niederschläge" (*Annalen der Hydrographie und Maritimen Meteorologie*, March) is of great interest. The author has analysed the variations in the yearly number of barometric minima which pass along this cyclone track, as specified by van Bebbler, for the long period 1874 to 1901. He shows that the variations are in general agreement with an inverted sun-spot curve, that is, that there is a greater number of these low pressure areas at sun-spot minima than at the maxima. There are, however, several outstanding minor variations of shorter period.

#### A CAMERA FOR NATURALISTS.

WE have recently had an opportunity of inspecting one of the "Birdland" cameras made by Messrs. Sanders and Crowhurst, of 71 Shaftesbury Avenue, to the design of Mr. Oliver G. Pike. Mr. Pike is well known as a specialist in the photography of birds and all that pertains to them, and so far as we, who are not specialists in this matter, are able to judge, the camera that he has designed is excellently adapted for the use of naturalists. Certainly no pains have been spared on the part of the makers to carry out Mr. Pike's ideas in a serviceable and practical way. The lens is a Goerz double anastigmat of 7 inches focal length, and by opening the front of the camera and drawing the lens forward, a change that is effected in a few seconds, the back combination may be used alone.

The range of focusing is sufficient to photograph objects within four or five feet even when the single combination is used, and the power that this provides in conjunction with the lens of twelve or thirteen inches focal length in getting large images will be appreciated by anyone who has attempted the photography of small animals. Focusing scales are affixed both for the complete lens and the single combination, though these would probably be rarely used, as the finder is a reflex arrangement that gives a full-size view of the image that falls upon the plate when the shutter is operated. An important point with regard to the finder is that its image can be seen when viewed from above, as usual, and also by looking horizontally when the camera is level with the eye. A mirror in the hood effects this desirable convenience. The shutter is the focal plane Anschutz, but with a device made specially by Messrs. Sanders and Crowhurst for linking it with the mirror within the camera that reflects the image upwards on to the finder screen. One release removes the mirror and operates the shutter, all the movements taking place smoothly and practically noiselessly. The camera is covered with a dull green leather, and all metal parts are bronzed, so that it forms an inconspicuous object in the ordinary surroundings of the country.

#### ENTOMOLOGY AT THE CAPE.<sup>1</sup>

THE Cape has been described as the most magnificent natural museum of insect pests and parasitic diseases which the world possesses, and the report of Mr. Lounsbury for 1901 shows that, despite the dislocation induced by the war, he is making good use of his opportunities. The

<sup>1</sup> Cape of Good Hope Report of the Government Entomologist for 1901. Pp. 103. (Cape Town, 1902.)

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various reports show clearly the directions economic entomology is now taking—the introduction of parasitic species which prey upon the pests, particularly of ladybirds feeding upon aphids and scale—fumigation of infested plants with hydrocyanic acid or carbon bisulphide—and the compounding of different sorts of spraying mixtures. Mr. Lounsbury gives accounts of several attempts at the introduction of exotic ladybirds from California to keep mealybug, scale and American blight in check, though none of them have yet become established, as has, however, been successfully achieved with the Vedalia, which keeps *Icerya purchasi* in check. Various recipes for making paraffin emulsions are given; considering the efficacy of paraffin as an insecticide, and the difficulty that is always experienced in keeping it emulsified, it is strange that more trial is not made of the method devised by Mr. H. H. Cousins of increasing the specific gravity of the paraffin by dissolving naphthalene in it. Another section of economic entomology treated in this report is the investigation of a cattle tick which serves as an intermediary host for a parasite causing "heart water," a disease mainly affecting sheep and goats, and of another tick-propagated disease known as malignant jaundice of dogs.

One interesting application of modern methods which may be found here reported is the fumigation with hydrocyanic acid of gaols, asylums, and kindred public buildings to free them of the insect vermin which are so terribly abundant in South Africa.

#### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Mr. A. C. Seward, F.R.S., has been reappointed University lecturer in botany. The University lectureship in midwifery is vacant by the resignation of Mr. Stabb. Candidates are to make application to the Vice-Chancellor before October 20. Mr. L. Doncaster, King's, has been appointed assistant to the superintendent of the museum of zoology.

The University College of South Wales and Monmouthshire, Cardiff, is proposed for adoption as an institution affiliated to the University of Cambridge.

Dr. Humphry, Dr. S. West, and Dr. W. Hale White have been appointed examiners in medicine; Dr. Herman and Dr. Handfield Jones examiners in midwifery; and Mr. Clinton Dent, Mr. E. Ward, and Mr. E. Owen examiners in surgery—for the third M.B. examination. Mr. F. C. Parsons, St. Thomas's Hospital, London, has been appointed an examiner in human anatomy. Mr. A. E. Shipley has been reappointed University member of the council of the Marine Biological Association.

A chair of agricultural botany has been established at the University of Rennes, and M. Daniel has been elected the first professor.

THE late Alderman Benjamin Robinson, chemical manufacturer, bequeathed 500*l.* for scholarships in connection with the Royal Salford Technical Institute.

DR. J. J. R. MACLEOD, assistant demonstrator of physiology at the London Hospital, has been appointed professor of physiology at the Western Reserve University, Cleveland, Ohio.

DR. JOHN RYAN has been appointed principal of the Paddington Technical Institute of the London County Council. Dr. Ryan was formerly professor of engineering at University College, Nottingham, and at University College, Bristol, and has for the past three years held the post of principal of the Woolwich Polytechnic.

THE Edinburgh summer meeting, which was instituted in 1886 and held annually until 1899, is now to be resumed, and the course will extend from August 3 to 29. The meeting will be directed by Prof. Patrick Geddes, and will deal this year especially with a study of Edinburgh and its region. The requirements of Scottish and English teachers in nature-study will receive prominent attention, and a series of excursions to various places of interest will be held. Sir John Murray, Prof. J. Arthur Thomson, and